No. 649,474. Patented May 15, 1900.

R. A. PALMER.

HEATER.

(Application filed Jan. 29, 1898.)

(No Model.)

4 Sheets—Sheet 1.

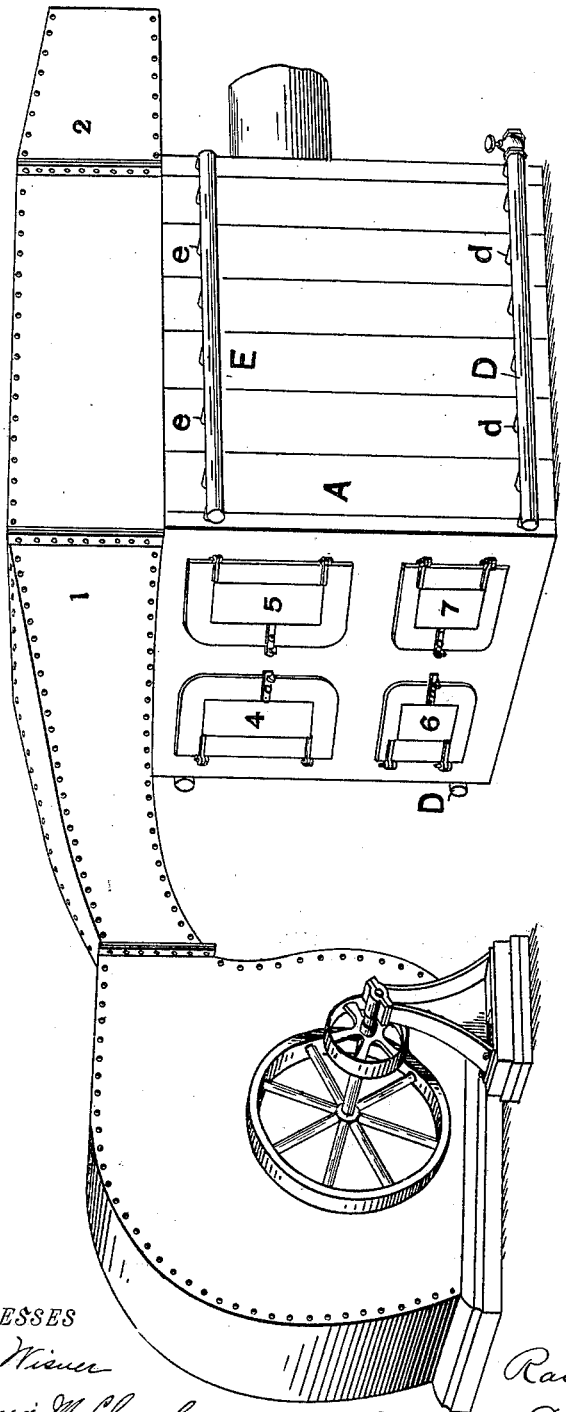

Fig. 1.

WITNESSES
Chas Wisner
Virginia M. Clough.

INVENTOR
Randall A. Palmer
By Parker & Burton
Attorneys.

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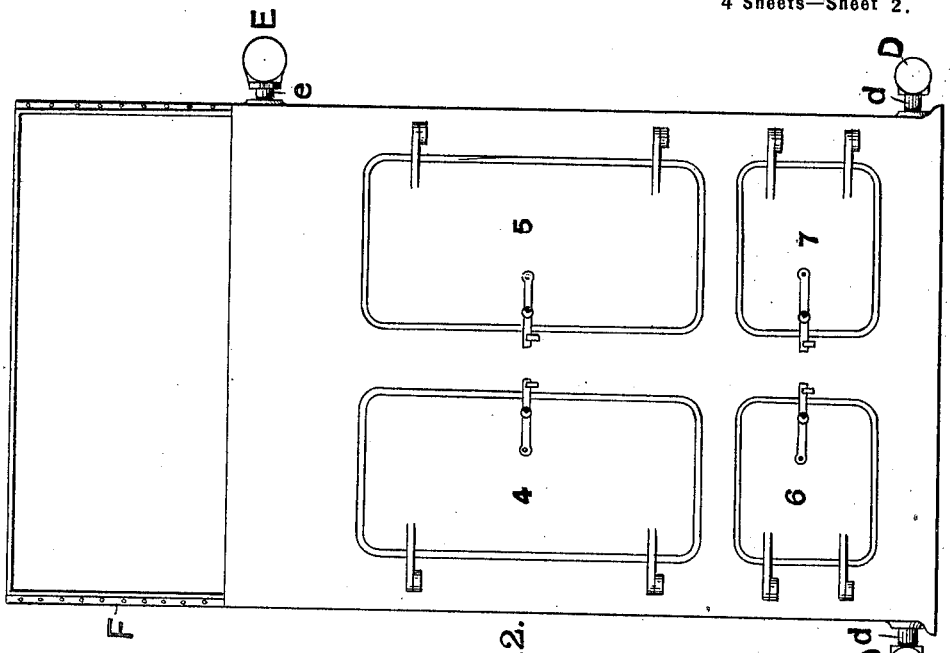

Fig. 2.

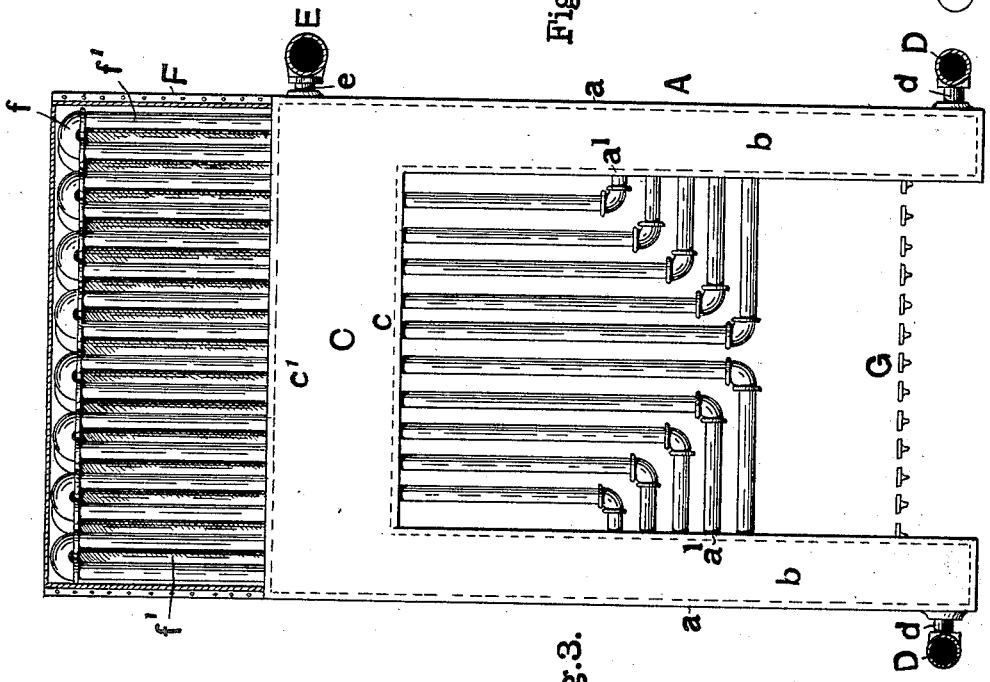

Fig. 3.

WITNESSES
Chas. Wisner
Virginia M. Clough.

INVENTOR
Randall A. Palmer
By Parker & Burton
Attorneys.

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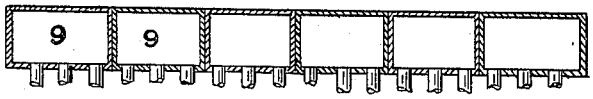
(No Model.) 4 Sheets—Sheet 3.

Fig.8.



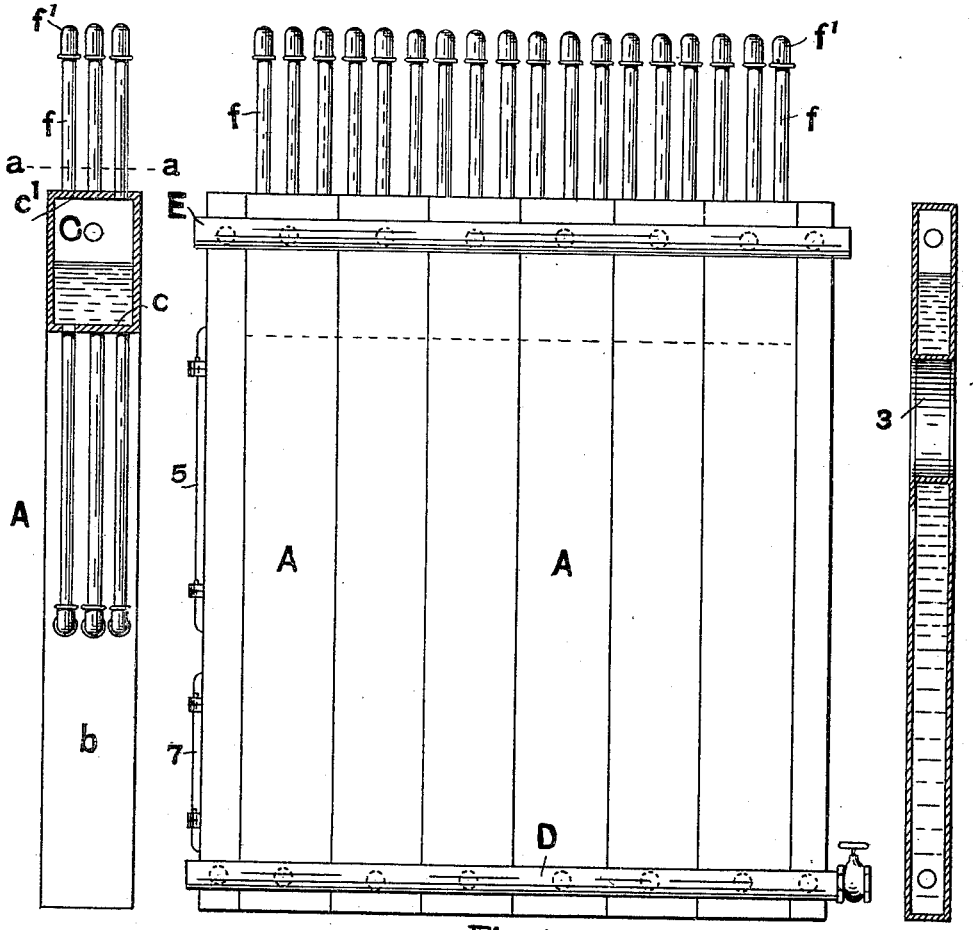


Fig.6. Fig.4. Fig.5.

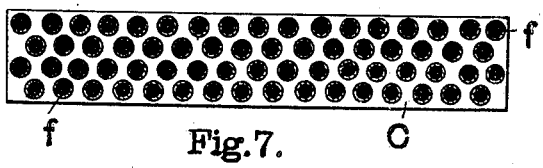


Fig.7.

WITNESSES
Chas Wiener
Virginia M. Clough.

INVENTOR
Randall A. Palmer
By Parker & Burton
Attorneys.

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R. A. PALMER.

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(Application filed Jan. 29, 1898.)

(No Model.) 4 Sheets—Sheet 4.

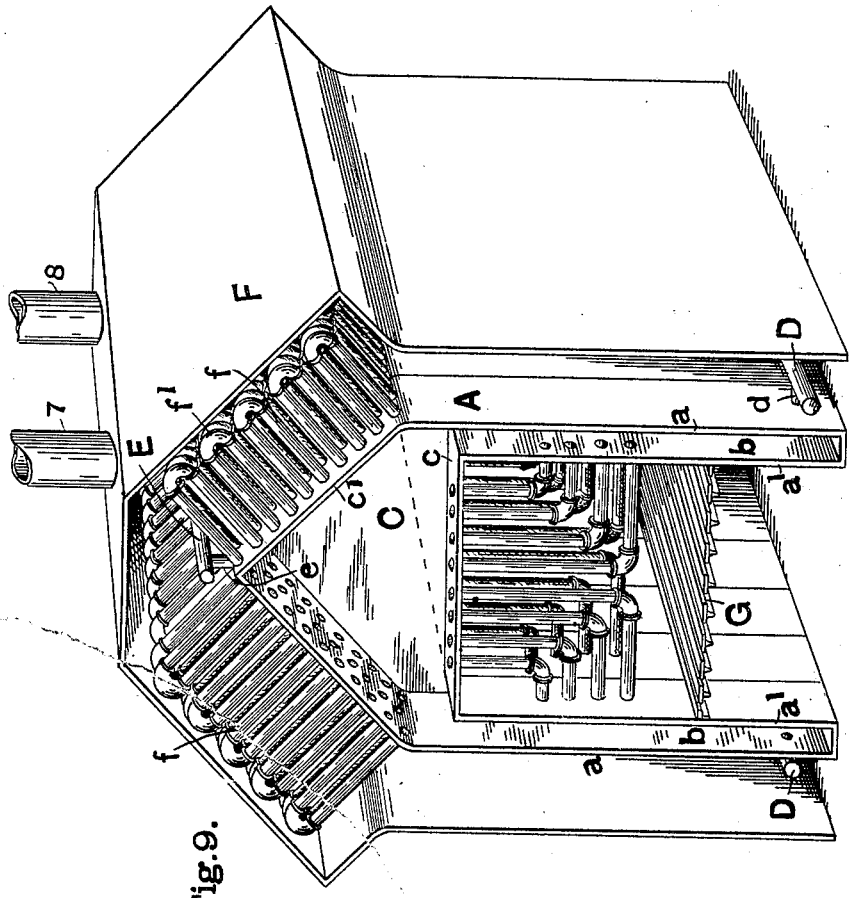

Fig. 9.

WITNESSES

Chas. Wiener

Virginia M. Clough.

INVENTOR

Randall A. Palmer

By Parker & Burton

Attorneys.

UNITED STATES PATENT OFFICE.

RANDALL A. PALMER, OF PHILADELPHIA, PENNSYLVANIA.

HEATER.

SPECIFICATION forming part of Letters Patent No. 649,474, dated May 15, 1900.

Application filed January 29, 1898. Serial No. 668,412. (No model.)

To all whom it may concern:

Be it known that I, RANDALL A. PALMER, a citizen of the United States, residing at Philadelphia, county of Philadelphia, State of Pennsylvania, have invented a certain new and useful Improvement in Heaters; and I declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to heaters employing either hot water or steam as the means intermediate between the fire and the air which is to be heated and delivered for warming purposes; and it has for its object various improvements, which will be hereinafter described and pointed out.

In the drawings, Figure 1 shows the heating-furnace in perspective and indicates the connection therewith of a fan-blower employed to drive the air on the heated surface and distribute it for heating purposes. Fig. 2 is an end elevation of the heating-furnace. Fig. 3 is a vertical cross-section. Fig. 4 is a side elevation. Fig. 5 is a detail of the back section of the furnace. Fig. 6 is a vertical section longitudinal of the furnace and showing a single one of the sections employed to constitute the completed furnace. Fig. 7 is a horizontal section at the line *a a* of Fig. 6, showing the arrangement of the tubes employed to furnish radiating-surface. Fig. 8 shows the form adopted at the top of the radiating-tubes when hot water is employed instead of steam. Fig. 9 indicates a form of furnace in which the radiating-pipes are placed obliquely instead of vertically, as shown in Fig. 4.

The furnace employed is preferably made up of sections, a number of which are aggregated together to constitute the complete furnace, and by the use of such sections the depth of the furnace from front to rear may be made of a size adequate to the work that is to be performed, few sections being used where a small building is to be heated and more sections being used where a large building is to be heated, and the sections may be aggregated until the fireplace is as large as can be conveniently employed in a single structure.

A description of a single section and statement of the manner in which the several sections are connected will suffice for a clear understanding of the invention.

A indicates such a section, which is made substantially rectangular in shape, with an outer shell *a* and an inner shell *a'*, joined by cross-walls and end walls, so that the entire structure has a U form and is disposed in the position of an inverted U, thus forming two water-legs *b b*, which are united by a chamber C, and the entire space composed of the chamber inclosed by the water-legs *b b* and the chamber C constitutes one water-receptacle closed on all sides except for the pipe-openings hereinafter described. At the bottom of each water-leg and on the outside is an opening for the pipe *d*, and the several pipes *d d* from the several sections lead into manifold pipes D D, which unite the several sections at their lower extremities. It is necessary that there be such a manifold connected with each series of water-legs in order that the circulation of water of the several sections may be perfect. Through the walls, near the upper part of the chamber C, on one side of each section, is an opening for the reception of the pipe *e*, by means of which each section is connected to the steam-manifold E. The inner wall bounding the under side of the chamber C is tapped for the reception of a number of pipes, and the inner vertical wall of each water-leg is also tapped for the reception of pipes. One half the vertical pipes dropping from the wall *c* are connected by suitable couplings with the pipes that come from the wall *a'* of one water-leg, and the other half of the vertical pipes are connected with similar pipes coming from the wall *a'* of the other water-leg. This furnishes an abundance of heating-surface over the fire-grate G. The upper wall *c'* of the chamber C is tapped for the reception of pipes that rise in pairs from the upper surface of the chamber C, and each pair of pipes is united at the upper end by a double elbow-joint *f*. These vertical pipes are covered in on two sides by the casing F, and at two sides are connected with the inlet and outlet pipes for the air that is used to distribute the heat. These inlet and outlet pipes are indicated in Fig. 1 at 1 and 2.

The vertical pipes or coils f' furnish an abundant radiating-surface to thoroughly heat the air, which is either drawn over or driven over by them through the casing F, and the fact that they are closely connected with the boiler and are vertical to it or sharply oblique to it, as in Fig. 9, causes all the waters of condensation to drop immediately back into the boiler, and there is no possibility of any accumulation of waters of condensation at any place that would be injurious. The air heated by contact with the coils f' has all the characteristics of steam-heated air as distinguished from the dry air of furnace heat, and the heat carried by the air is distributed to the places where it is desired to use it, with all the desirable features of indirect radiation. The rooms or apartments to be heated are not occupied by any radiating-surface, but the heated air is delivered to them through registers, with all the advantages of indirect radiation as compared with direct radiation.

The back wall of the furnace instead of being in the U form described as the form of a section is in a box form and is provided with a suitable passage-way 3 through it for the exit of the products of combustion. The front wall is also a hollow wall and is provided with openings for clean-out doors 4 and 5 and for fire-doors or stoke-doors 6 and 7.

The ash-pit and the ash-pit door are not indicated in this furnace, and in ordinary structures they would be built like a separate structure beneath the level of the water-legs *b b*.

The form shown in Fig. 9 is more adapted to a furnace in which the distribution of air is produced without the aid of a fan or blower, but in a way in which hot air ordinarily distributes itself. In this form the casing F is extended downward along the side of the furnace-walls, leaving the air-space between the casing and the furnace-walls, and the air to be distributed is admitted at the bottom of the casing and passes out through pipes 7 and 8, whence it is led away to the place where it is to be used.

In case it is desired to use this furnace for hot water rather than steam the radiating-pipes f of each section are led into manifold boxes 9, which unite all the pipes of one section, and the ordinary expansion-tank (which is not shown) would be located at some convenient place to provide for keeping the several sections of the boiler full of hot water at all times and to provide for the proper release to the boiler when the heat causes the water inclosed in it to expand; but in the ordinary form of boiler (shown in Figs. 4 and 6) the water would not rise to fill the entire structure, but only enough to partly fill the chamber C, as indicated in Fig. 6, the manifold E being utilized as a steam-conductor and not as a water-conductor in this casing.

What I claim is—

In combination with a boiler, having the shape in cross-section of an inverted U, a plurality of radiating-tubes rising in pairs from the top thereof, each of said pairs having the shape of an inverted U, the legs of which communicate with each other at the top, and with the boiler at the bottom, a casing inclosing said tubes, and the top of the boiler, and adapted to direct air-currents into contact with the inclosed heating-surface, the space between the vertical portions of said boiler communicating with the furnace, and L-shaped pipes in the space between the vertical portions of said pipes communicating with the vertical portions of said boiler and the vertical portions of said pipes communicating with the horizontal portion of said boiler, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

RANDALL A. PALMER.

Witnesses:
ARTHUR B. HUEY,
B. B. HESTOR.